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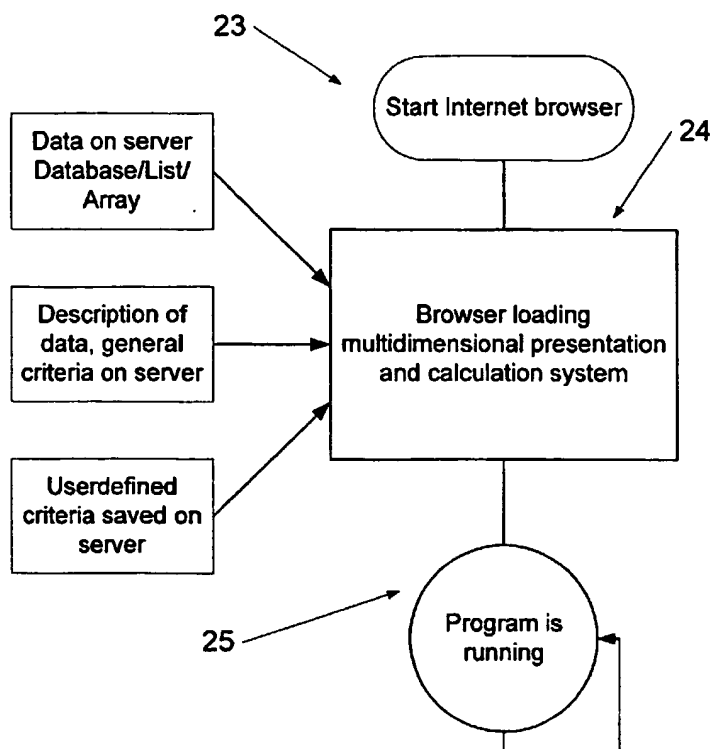
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(54) Title: A WEB BASED MULTIDIMENSIONAL PRESENTATION AND CALCULATION SYSTEM



(57) Abstract: The present invention comprises an electronic presentation and calculation system for presenting data in fields. The system comprises a server comprising a set of data to be presented and a client device for communicating with said server and presenting said data. The server comprises memory means for storing information linking field identification and data together. The fields are identified by co-ordinates, where at least one of the fields is identified by a first number of co-ordinates, and at least one other field is identified by a second number of co-ordinates, the first number of co-ordinates is different from the second number of co-ordinates. The client device comprises means for initiating and terminating the electronic presentation and calculation system and presenting said data in said linked fields according to said first and second number of co-ordinates. The server could i.e. be a web server or a database server and the client device could i.e. be a mobile terminal such as a mobile phone or a stationary terminal, such as a personal computer. The first or the second

set of co-ordinates stored in the memory means of the server and linked to the fields could be co-ordinates defining a x, y, z position, where the z position is a stack position at a field. The means for initiating the electronic presentation and calculation system could e.g. be a browser, a Java Applet in an HTML document or a JAVA MIDlet on a mobile Java based device.

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A Web based multidimensional presentation and calculation system

FIELD OF THE INVENTION

The present invention relates to the field of communication of information in the form of a
5 method of presenting, calculating, consolidating and comparing electronic data on
stationary or mobile terminals connected to a net, e.g. the Internet, an Intranet or an Extra-
net.

BACKGROUND OF THE INVENTION

10 In recent years the Internet has become a medium via which businesses, specialists and
ordinary people retrieve information of any kind - both information about prices of
consumer products and statistical information that was previously accessible only in printed
publications. Further, it has become more common that businesses publish data on the
individual business on the Internet in so-called business portals. The growing distribution of
15 handheld media, e.g. telephones with WAP connection option or media based on Java K
virtual machines, implies that future retrieval of information will increasingly be carried out
by means of such wireless connections.

Businesses are showing a soaring interest in using the Internet and/or an Intranet for
20 communication with employees, customers and co-operators. This communication may
e.g. take place via business portals, where large quantities of information from and about
the businesses in the form of statistical material, illustrations, etc. are made available to
customers, suppliers and others having access to a web browser. Moreover, many
publishers of information/statistical material, in the public as well as the private sectors,
25 publish figures and other information on the Internet.

However, if large quantities of data, e.g. presentation of statistical material, are to be com-
municated efficiently on the Internet/an Intranet, a new technique is needed as opposed to
that used today, when the presentation takes place primarily by means of HTML tables or
30 other Internet formats (e.g. XML), and the user often finds that it is a problem that the data
are "dead" and in most cases impossible to get an overall view of. If the user wishes to
analyse data further, he often has to download data to his client machine. This has as a
necessary prerequisite that the information provider makes data available, so that the user
may view the figures in HTML format or other Internet formats and has data on the server
35 machine, so that they may be downloaded in e.g. a spreadsheet format. If data can be

downloaded, the user is reduced to process them in the format (e.g. Excel) determined by the data manufacturer. Thus, a further prerequisite is that the user has a programme on his computer capable of reading data.

- 5 Apart from the above demands for collecting and viewing external information, businesses also need to collect and store information related to the operation of the business, and as described above businesses need to be able to view/assess and process large quantities of data in an expedient way when working with external information.
- 10 Further, businesses need to be able to consolidate these large quantities of data - i.e. process them in order to create tools for managing the business - and typically this processing takes place either in spreadsheets with service programs produced for this purpose especially or in large database systems.
- 15 Therefore, it is considered a problem that in prior art technology the quantity of relevant information/figures is often large. Even though the manufacturer makes an effort to design tables, none of the prior art techniques provide an easy and quick overview for the user. The manufacturer can make small tables as a remedy, but then the user will hardly get all the necessary and/or relevant information.
- 20 Often retrieval of information in statistical material requires many inquiries, and it is also often seen as a problem that it takes time to navigate between the various HTML documents, and during this process it is also easy to lose track of things.
- 25 It is also seem as a problem that by means of prior art technology the user can only make very rough adaptations of the information, and this will typically only be in the form of queries to a database on the server machine.

Another problem of prior art technology is that when the data has been presented, the user
30 will typically not be able to further process the figures on-line. Presentation of information/figures in a new manner requires another query to the server machine. The new presentation will thus replace the old presentation, and it will not be possible to compare the two presentations. To the extent that the user is at all capable of making extracts from a database, a useful result often requires thorough knowledge of the contents of the data-

base and typically programming skills. Thus, the user will typically have to take a course in the techniques in question.

Further, it is seen as a problem of prior art technology that when the user is to further
5 analyse data in a given presentation, he often has to download these data to his client machine (computer or mobile terminal with e.g. WAP interface), and in this instance further have a programme capable of carrying out the necessary processing of the information in order to be able to make a new presentation from given data.

10 In conclusion, it is therefore seen as a problem of prior art technology that when working on-line with figure data on the Internet, an Intranet or an Extranet, the user lacks an overview of large quantities of data, that the time consumption in connection with download of documents, and translation into the correct formats is increased, and that the possibility of direct and on-line processing in the form of calculation, consolidation and/or comparison of
15 data on the Internet, an Intranet or an Extranet is lacking. These shortcomings are further enhanced, when and if mobile units with WAP or mobile units with Java K virtual machines are used.

Moreover, it is seen as a problem of prior art technology that whether the above process-
20 ing/consolidation of data takes place in a spreadsheet with service programmes or in databases, the programmes are expensive and not very accessible, and can only be used by persons with extensive IT knowledge.

Traditional spreadsheet programmes do not solve the problem satisfactorily. They are pro-
25 duced as standard software, which is why their access is general, and even though attempts have been made to facilitate work with large quantities of figures by linking several different spreadsheet documents, the quantity of data, with which it is possible to work, is limited, and advanced data processing is often only achieved by means of pivot tables (a spreadsheet function found e.g. in the spreadsheet Excel, which makes summary data in a
30 spreadsheet on the basis of data in e.g. databases), macro language (which is different from product to product and requires super user training), or by means of specialist programmes from third part suppliers.

It is further seen as a problem of prior art technology that if the above tasks take place by
35 means of a database, it is necessary in order to obtain the desired results to make queries

in Structured Query Language (SQL), which is not mastered by ordinary users. The database suppliers have not made a sufficient effort to develop efficient user interfaces with dialog comprehensible to the end user.

5 When considering large quantities of data in an expedient manner, it is often advantageous to view the data in layers of sequential data. Examples of such layers of data may be a time series in a report, a worksheet in a spreadsheet, or a record in a database, in which it is possible to page through the layers in order to view the data therein. A special problem arises if a user also wishes to make e.g. time series analyses on the Internet. In order to
10 handle this problem it has often been necessary to construct OLAP systems, wherein data are placed in cubes (see e.g. Database Systems "A Practical Approach to Design, Implementation and Management", Thomas Connolly, Carolyn Berg, Anne Strachan, 1999 Addison Wesley, 2. edition ISBN 0-201-34287-1, pages 948-957) on top of the original databases.

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Moreover, it is problem of prior art technology used on the Internet that both of the above-mentioned types of programme lack transparency in the sense that it is not possible naturally to maintain the contents of a layer while paging through and viewing the contents of other layers, which makes navigation difficult and obstructs the overview. Typically, the
20 results appear following queries or execution of service programmes, and the presentation is then made in isolation from the original data.

The object of the present invention is to solve the above mentioned problems.

25 SUMMARY OF THE INVENTION

The present invention comprises a system for electronic presentation and calculation of data presented in fields, said system comprising

- 30 - a server comprising a set of data to be presented,
- a client device for communicating with said server and presenting said data,

said server comprising

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- memory means for storing information linking field identification and data together, said fields being identified by co-ordinates, at least a first field being identified by a first number of co-ordinates, and at least a second field being identified by a second number of co-ordinates, the first number of co-ordinates being different from the second number of
- 5 co-ordinates,

said client device comprising

- means for initiating and terminating the electronic presentation and calculation and
- 10 for presenting said data in said linked fields according to said first and second number of co-ordinates.

The server could i.e. be a web server or a database server and the client device could i.e. be a mobile terminal such as a mobile phone or a stationary terminal, such as a personal

15 computer. The first or the second set of co-ordinates stored in the memory means of the server and linked to the fields could be co-ordinates defining a x, y, z position, where the z position is a stack position at a field. The means for initiating the electronic presentation and calculation system could e.g. be a browser, a Java Applet in an HTML document or a Java MIDLet on a mobile Java based device.

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Thereby a multidimensional information and calculation system for use in stationary or mobile (e.g. WAP or Java-based mobile units) terminals connected to the Internet, an Intranet or an Extranet, wherein one or more multidimensional stack(s) of tables consisting of cells or fields is/are presented in an on-line document (e.g. an HTML document). A stack

25 consists on n different layers of two- or multidimensional tables. On top of the stack a given layer of fields or cells or tables consisting thereof is shown at any time as a two- or multidimensional spreadsheet. In the on-line document the multidimensional stack(s) of tables overlap(s) other tables - two- or multidimensional - with cells or fields. A three-dimensional stack of cells, wherein each cell has a x, a y and a z co-ordinate may e.g.

30 overlap a two-dimensional stack of cells, wherein each cell has a x and a y co-ordinate.

In an embodiment the electronic presentation and calculation system is a spreadsheet and the fields for data are cells in a spreadsheet.

In an embodiment of the invention the contents of a cell may be data constituting a figure, a text, sound, film, or serving as references to such data.

Thereby a multidimensional information and calculation system is provided for use on
5 stationary or mobile (e.g. WAP or Java-based mobile units) terminals connected to the Internet, an Intranet or an Extranet, wherein the contents of cells, fields or tables may consist of figures, text, images, sound, film, functions or formulae as well as references to such data in other tables in the on-line document for use in connection with inquiries, calculations and/or comparisons.

10

In a specific embodiment the criteria in the layers may be data constituting a figure, a text, an image, sound or serving as references to such data.

According to the invention a system is provided, in which each layer in a multidimensional
15 stack may have one or more criteria associated therewith. The criteria in the layers may consist of text, figures, sound, images, etc. The user may add, modify and/or delete criteria in the individual layers.

According to the invention a system is provided, in which the user may page through the
20 layers in the stack and thus determine which table should be visible on top of the stack.

According to the invention a system is provided, in which the user, e.g. by means of check off fields in a dialog box or definitions in a file (e.g. a text file), may indicate whether one or more multidimensional layers in a stack of cells, fields or tables consisting thereof should
25 be included in presentations, calculations or comparisons.

According to the invention a system is provided, in which the user may indicate, e.g. by means of check off fields in a dialog box or definitions in a file (e.g. a text file) for cells or fields or tables consisting thereof, placed in a multidimensional stack or not, whether they
30 should be included in presentations, calculations and comparisons.

According to the invention a system is provided, in which the user can sort the layers in the multidimensional stack according to the criteria of the layers or the contents of one or more cells or fields.

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According to the invention a system is provided, in which presentations, results, calculations and comparisons, etc. are modified when the user e.g.:

- selects a new multidimensional layer (table of cells, fields) on top of the stack
or
- 5 • modifies the criteria on one or more multidimensional layers in the stack.

According to the invention a system is provided, in which data may be selected/input/loaded in(to) multidimensional stack(s), cells or fields from databases (object-oriented, relational or more simple lists/arrays/hash tables) or from on-line documents (e.g.

10 HTML documents) or OLAP cubes.

According to the invention a system is provided, in which it may be determined from criteria or other selections associated to the layers in stack(s) and/or cells or fields by the user in connection with previous processing which data to be input or processed, and wherein it is

15 also possible in advance to associate cells or fields or layers consisting of these criteria during the input process.

According to the invention a system is provided, in which it is possible to perform a multidimensional calculation (e.g. calculate the sum of all cells with given x and y co-or-
20 dinates in a three-dimensional stack) of data in stacks containing layers of cells, fields or tables consisting thereof, and in which the obtained results can be shown in such cells, fields or tables consisting thereof.

According to the invention a system is provided, in which it is possible to choose which
25 calculations (e.g. sum calculations) should be made from e.g. a pop-up menu in the system.

According to the invention a system is provided, in which it is possible to indicate whether the currently loaded data set should be replaced by another specified data set, e.g.

30 determined by a definition file in the system.

According to the invention a system is provided, to which it is possible to import data from HTML documents or other on-line documents and during this import specify (e.g. determined by a definition file in the system), which continuous or separate columns, rows

35 and/or frames should be included during the import.

According to the invention a system is provided, in which during import it can be determined (e.g. determined in a definition file in the system) where data should be placed and whether these data should be arranged flatly in the two-dimensional area consisting of
5 cells, fields or 2D tables consisting thereof or multidimensionally, e.g. three-dimensionally (along a third z axis) in the stack of cells or fields in the system, and in which new cells, fields or multidimensional tables consisting thereof are created in the stack, if they did not exist prior to import.

10 According to the invention a system is provided (e.g. by means of check off fields in a dialog box or a definition file in the system), in which it is possible to copy several criteria of possibly non-continuous layers in one working operation, and in which it is also possible to insert criteria in several, possibly non-continuous layers of cells, fields or multidimensional tables consisting thereof in one working operation.

15

According to the invention a system is provided (e.g. by means of check off fields in a dialog box or a definition file in the system), in which it is possible to have selections of cells, fields or 2D tables consisting thereof shown from layers associated to (a) further defined criterion/criteria.

20

According to the invention a system is provided (e.g. by means of a pop-up menu or a dynamic table), in which it is possible to view data in the virtual stack of cells, fields or 2D tables consisting thereof either from the side or from below as a virtual block of data.

25 According to the invention a system is provided, in which it is possible to create new tables (2D or multidimensional) with associated data sets by dragging existing data sets to a new position in the system or similarly to another on-line document by means of the mouse or another selection medium, e.g. arrow keys.

30 According to the invention a system is provided (e.g. by means of check off fields in a dialog box or a definition file in the system), in which the on-line document cells, fields or tables consisting thereof can receive data in the form of either text, sound, images, functions or formulae from other on-line documents, and in which it may be specified by means of criteria whether data thus transferred should be included in calculations or other
35 on-line actions.

According to the invention a system is provided, in which the users are automatically assigned cookies that save information on the user's use of the system criteria, and in which this information may be used to form a customer profile that by means of criteria
5 provides advanced possibilities of selecting which layers of data the customer should be presented with, which calculations should be made and how to present the data.

According to the invention a system is provided, in which data from cells, fields or 2D tables consisting thereof may be illustrated by diagrams or graphs.

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BRIEF DESCRIPTION OF THE DRAWINGS

The present invention will now be explained in further detail with reference to the accompanying figures in which

15

figure 1 shows the multidimensional presentation and calculation system implemented in an on-line document (HTML document) on the Internet,

figure 2 shows that criteria can be added to layers, and that it is possible to page through the layers on-line,

20

figure 3 shows that data in block have been replaced following paging, and that the results have consequently also been modified,

figure 4 shows a column, in which the results depend on how many and which layers, de-
25 termined from criteria, are included in the calculations,

figure 5 shows how criteria can be added to layers,

figure 6 shows a layer, to which a criterion has been added,

30

figure 7 shows that the results have been altered following the addition of the above-mentioned criterion,

figure 8 shows a dialog box, in which it may be determined if the individual layer should be
35 included in calculations,

figure 9 shows a dialog box, in which it may be specified how the layers should be sorted,

figure 10 shows a pop-up menu with functions adapted especially to multidimensional calculation,
5

figure 11 shows the first layer in a stack of 2D tables. The 2D table contains numerical values in the fields,

10 figure 12 shows a second layer in a stack of 2D tables. The 2D table contains numerical values,

figure 13 shows a block consisting of fields. The block contains numerical values,

15 figure 14 shows the same 2D table with the same numerical values as were shown in figure 11, but with the two first columns marked,

figure 15 shows a block consisting of fields. The block corresponds to the two first columns in the block mentioned in figure 12,

20

figure 16 is a flow chart illustrating what happens during initiation of the multidimensional information and calculation system,

figure 17 shows how the internal data presentation is structured in the multidimensional information and calculation system,
25

figure 18 shows a diagram illustrating the numerical values shown in the fields,

figure 19 shows, by means of a diagram, the expediency of the multidimensional structure,
30 it being possible to view numerical values and diagrams in one display.

DETAILED DESCRIPTION OF THE INVENTION

It is a disadvantage of the existing technology for use on the Internet via a browser, a WAP medium or a mobile unit with a virtual machine, that the presentation of data often appears
35 as impossible to get an overall view of, and that interaction with the medium is not

accessible to the extent desired, data being presented as either non-editable HTML documents or as other non-interactive documents on the World Wide Web. If data and/or results are retrieved from databases, a query must be sent to a database, and only highly trained staff master database programming to the extent required to extract desired data sets.

However, in the present multidimensional presentation and calculation system for use on terminals connected to the Internet, it is an advantage that it is possible to view data in layers and thus maintain the overview when working with large quantities of data.

10 At the same time the user can produce models by simple means, in which models desired data sets are presented side by side, after which further processing or comparison can be made.

In order to illustrate the principle and the advantage of using a multidimensional information and calculation system connected to the Internet, an Intranet or an Extranet via stationary or mobile (e.g. WAP) terminals, in which one or more multidimensional stack(s) of tables is/are presented in an on-line document (e.g. an HTML document).

Figure 1 shows an example of on-line data processing, wherein numerical values 1 and results of calculations 2 on data from layers in the model can be viewed in an HTML document 3 and comparisons made 4. In the example the stack 5 consists of 275 layers (one layer for each municipality in Denmark containing data from municipalities in Denmark), each with a 2D table consisting of cells or fields, and at any time a given table (municipality) will be visible on top of the stack. Next to the multidimensional stack of layers containing information on all municipalities, formulae are placed in a two-dimensional, global layer of cells, fields (tables) encircling the multidimensional stack in the on-line document, in which formulae the fields (cells) contain functions referring to the layers and thus in the example showing the above results of calculations on data in the layers in the stack.

30

Figure 2 illustrates an on-line document with a multidimensional stack of layers, in which each layer may further have one or more associated criteria determining how the calculation components process data. Thus it is possible in figure 2 to view a pop-up menu, in which the layer "Jægerspris" 6, as described above, has been assigned the criteria "F" and "W" that determine how subsequent calculation should be made. The user may add,

35

modify or delete criteria in the individual layers and the criteria may consist of text, figures, sound, images, etc. This pop-up menu can also be used for paging through the layers 7, and in the illustration it is shown how the user selects the layer "Hørsholm" and thus selects or determines that a shift should be made to this layer, so that it becomes the
5 visible layer on top of the stack.

In figure 3 it can be seen that the data 8 of the municipality of Hørsholm in the stack of tables are now visible in the HTML document, and it can further be seen 9 how calculations and consequent results, comparisons and the contents of the presentation have been
10 modified as compared to the results of that same column in previous figure 2 by the described shift of layer.

In figure 4 it is further illustrated how presentations, results, calculations and comparisons, etc. are modified when the user inserts or modifies a criterion on one or more layers of tables in the stack. Farthest to the right in the illustration, a column "Sammenlignings
15 Gruppe" with results 10 can be seen. Data included in the calculation of the results of this column are selected by means of criteria in such a manner that only the layer with an associated, further specified criterion contribute data to the calculation. By adding one or more criteria as illustrated in Figure 5, the user thus modifies the result in the above
20 column (Sammenlignings Gruppe). When the user clicks 11 a button (in the illustration "Tilføj til Gruppe ") a criterion is added to the currently visible layer, and in Figure 6 it can be seen that a criterion "x" 12 has now been added to the layer "Jægerspris", after which this layer is included in calculations, and consequently it can be seen in Figure 7 that the results in the column farthest to the right have now been altered 13 because of the new
25 criterion in the layer "Jægerspris".

When working with data on the Internet the user cannot with prior art technology by simple means determine which data should be included in calculations. With the multidimensional information and calculation system it is a further advantage that as illustrated in Figure 8 it
30 is possible to determine if a given layer or data field should be included in calculations, sorting or be included in the quantity of data visible to the user. Thus, by clicking a button 14 in the on-line document, the user determines if data from the layer in question should be included in calculations and/or presentations.

In order to further enhance the overview when working on-line, it is also an advantage as illustrated in Figure 9 that the user can sort the stack layers of cells, fields or tables consisting thereof according to the criteria 15 of the cells, fields or layers or according to the contents 16 of one or more data fields in the layer.

5

Figure 10 illustrates a pop-up menu with functions calculated for calculation in the third dimension (along the z axis) in the system. The user may select the desired function for calculation across the layers by means of the mouse 17.

- 10 Figure 11 illustrates the top layer in a stack of cells or tables. In the example the cells or the table of cells on top of the stack contain some numerical values 18.

Figure 12 shows the second layer in the same stack of cells or tables. In the example the second layer contains other numerical values 19 than shown in Figure 11.

15

Figure 13 shows a block containing numerical values corresponding to the numerical values that will be seen if the cells or tables mentioned in Figures 11 and 12 are viewed from the side (in this case from the right). On top of the block the values 9, 8 and 7 are seen 20, said values corresponding closely to the values in the right column of the top layer in Figure 11. Similarly, the values 19, 18 and 17 correspond closely to the values of the right column of the second layer in Figure 11.

- 20

Figure 14 shows that the user may select which part of a stack of cells or tables he wants to view from the side. The area is selected by marking 21, and in Figure 15 it can be seen 25 that when the user then chooses to see the area in the block marked in Figure 14 from the right, the top layer in the resulting block 22 with the values 6, 5 and 4 corresponds closely to the values in the right column of the marked field in Figure 14. Similarly, the bottom layer of the column corresponds closely to the values in the right column of the second layer in the area marked in Figure 14.

30

Figure 16 illustrates how the user initiates his browser and thus connects his stationary or mobile terminal to the Internet, an Intranet or an Extranet, and chooses side 23 by the multidimensional presentation and calculation system (MPC). A browser is a program enabling the user to view and work interactively with all information or data on the Internet (e.g. the 35 World Wide Web), an Intranet or an Extranet. Typically, a browser will use Hypertext

Transfer Protocol (HTTP) for queries to Internet, Intranet or Extranet servers. Data may e.g. be HTML documents. In addition, a browser will be able to initiate and terminate programmes (e.g. Java applets), which are integrated into e.g. HTML documents.

Examples of such programmes are "Netscape Navigator" and "Microsoft Internet Explorer",
5 which can be used on computers/terminals with operating systems such as "Microsoft Windows 98/NT", "MacOS", and in the case of Netscape Navigator also the operating system Linux. Moreover, there are browsers that can be used in mobile (e.g. WAP) terminals. The MPC can be constructed from (software) components, which are one or more classes or instances of classes (objects), said components together performing a well-defined task in a
10 computer programme. Then the MPC is loaded by the browser 24, and the MPC loads components consisting of one or more classes or objects, and which may be executed as Java objects, with data from a server. From the server is further loaded components with information on data structure as well as user specific criteria, so that a well-defined task can be performed. The MPC creates a multidimensional stack of tables with data, criterion
15 25 being assigned to each layer as specified by components as mentioned above.

Moreover, as illustrated in figure 17, the MPC creates 2D tables for calculations and tables for labels 26. Calculation components are assigned to each table for calculations.

Each table consists of one or more fields for data.

20

Finally, the MPC creates a user interface with placements of stacks 27, tables, buttons, pop-up menus, etc. specified by components as mentioned above. Each layer in the multidimensional stack of tables of data has a criterion associated therewith, said criterion determining whether a table in the layer should be included in the calculations. By means
25 of a pop-up menu the user can determine which layer and thus table should be visible on top of the stack. When a new table is shown on top of the stack the calculation components, to which the calculation tables 28 refer, are invoked. The illustrated calculation table refers to a TABSUM component 29 performing sum calculations of the specified tables by means of calculation components 29. A calculation component is
30 loaded by the MPC if a calculation table refers thereto. Calculation components starting with B calculate multidimensionally in the stack of tables in a given field.

Figure 18 illustrates how it is possible to illustrate data 30 by means of a diagram 31, and

figure 19 illustrates how in the same display it is possible to view figures from a data set 32 and a diagram 33 created from a second data set, the data set being created from the data set shown in figure 18.

- 5 The invention may e.g. be implemented in programming language that can be executed in an Internet browser (e.g. Netscape Navigator or Microsoft Internet Explorer) or on top of a virtual machine such as Sun's K Virtual Machine (KVM) for mobile units.

An example of a programming language with the above characteristics is Java. A number
10 of development tools are available, including JDK 1.3 under the Java 2 Platform, standard edition or micro edition from Sun Microsystems, Inc. A description of Java both as programming language and platform can be retrieved at <http://www.javasoft.com> with SUN.

Use of the multidimensional presentation and calculation system (MPC) begins by the user
15 initiating his browser, thus connecting his stationary or mobile terminal to the Internet, an Intranet or an Extranet, and when the desired site is selected, the MPC is loaded by the browser. The MPC may be implemented as a stand-alone programme or as a Java Applet that is integrated in an HTML document, or as Java MIDLet for a mobile Java-based unit. If the MPC is implemented as a stand-alone programme, it may further be developed with
20 programming language such as C++ by use of class libraries (applications framework) such as Microsoft's MFC or Apple's MacApp.

Well-known spreadsheet techniques may be built into the MPC. An example of a spreadsheet programme is Excel from Microsoft. A detailed description of spreadsheet techniques, including multidimensional spreadsheet techniques, is found in US Patent Application No. 09/077,938. The MPC loads components, e.g. in the form of Java class files, with data from a web server or creates a connection to a database on a server. Initially, the MPC loads definition components (Java class files or text files) specifying (initialising) a concrete MPC, i.e. an indication of how data, user functionality and user interface are to be
30 executed. This may e.g. be accomplished by the MPC creating, on the basis of the definitions, a number of objects (e.g. Java objects) and placing them in the MPC system. A connection to a database may be established by means of Java's SQL, IO and NET packages. Moreover, information on data structure and user specified criteria is loaded from the server components. This may e.g. be implemented by means of Java objects
35 based on JDK's Collections Framework. Then the MPC creates a multidimensional stack of

tables of data, each layer being assigned criteria as specified by components mentioned above. Data may be text, images, sound, etc. implemented by means of Java objects. The criteria may be text, images, sound implemented by means of Java objects.

Further, the MPC creates 2D tables for calculations and tables for labels. Each table for
5 calculations are assigned calculation components and each table consists of one or more fields or spreadsheet cells for data. The tables may be implemented by means of Java's Collections Framework. The MPC saves references internally, e.g. in a list, or as pointers if the MPC is implemented in C++.

10 Finally, the MPC creates a user interface with placements of stacks, tables, buttons, pop-up menus, etc. specified by components as mentioned above. The components may be implemented by means of Java's AWT, Swing, Util packages. A table with labels may be based on lists from Java's Collections Framework, e.g. ArrayList, and contain references to String objects. The thus created multidimensional stack of tables of data has one or more
15 criteria associated to each layer, said criteria determining whether a table in the layer should be included in the calculations. Moreover, the user may determine, e.g. by means of a pop-up menu, which layer and thus table should be visible on top of the stack. When a new table is shown on top of the stack, the calculation components, to which the calculation tables refer, are invoked accordingly. The calculation table shown in the
20 illustration (figure 17) refers to a TABSUM component performing sum calculations of the specified tables. A calculation component may be implemented as a Java object with reference to the table to be calculated. Calculation components are used for the calculation, said calculation components being loaded by the MPC, if a calculation table refers thereto. The calculation components starting with "B" calculate multidimensionally in
25 the stack of tables in a given field. The calculation may e.g. be performed as an iteration over the elements of the table.

Although the present invention has been described in connection with the preferred embodiment, it is not intended to be limited to the specific form set forth herein. On the
30 contrary, it is intended to cover such alternatives, modifications, and equivalents, as can be reasonably included within the spirit and scope of the invention as defined by the appended claims.

CLAIMS

1. A system for electronic presentation and calculation of data presented in fields, said system comprising

5

- a server comprising a set of data to be presented,
- a client device for communicating with said server and presenting said data,

10 said server comprising

- memory means for storing information linking field identification and data together, said fields being identified by co-ordinates, at least a first field being identified by a first number of co-ordinates, and at least a second field being identified by a second number of
- 15 co-ordinates, the first number of co-ordinates being different from the second number of co-ordinates,

said client device comprising

- 20 - means for initiating and terminating the electronic presentation and calculation and for presenting said data in said linked fields according to said first and second number of co-ordinates.

2. An electronic presentation and calculation system according to claim 1, wherein the

25 client device presents said data in a spreadsheet according to said first and second number of co-ordinates.

3. An electronic presentation and calculation system according to claims 1 and 2, wherein the fields for data are cells in a spreadsheet.

30

4. An electronic presentation and calculation system according to claim 3, wherein said cells being addressed by more than two co-ordinates are shown in a browser window as a stack or stacks of two-dimensional spreadsheet layers.

5. An electronic presentation and calculation system according to claim 4, wherein a selectable spreadsheet layer is shown on top of the stack.
6. An electronic presentation and calculation system according to claim 5, wherein cells
5 addressed by two co-ordinates are further shown in an area of the browser window.
7. An electronic presentation and calculation system according to any of the preceding claims, wherein the contents of a cell may be data constituting a figure, a text, sound, film, or serving as references to such data.
- 10
8. An electronic presentation and calculation system according to claim 7, wherein each layer in a stack of spreadsheet layers may have an associated criterion.
9. An electronic presentation and calculation system according to claim 8, wherein the cri-
15 teria in the layers may be data constituting a figure, a text, an image, sound or serving as references to such data.
10. An electronic presentation and calculation system according to claim 9, wherein criteria can be added, modified and/or deleted in the individual layers.
- 20
11. An electronic presentation and calculation system according to claims 7-10, wherein it is possible to page through the layers in the stack of two-dimensional spreadsheet layers and thus determine which layer should be visible on top of the stack.
- 25 12. An electronic presentation and calculation system according to claims 7 - 11, wherein it may be indicated whether one or more layers in the stack of two-dimensional spreadsheet layers should be included in presentations, calculations or comparisons.
13. An electronic presentation and calculation system according to claims 7-12, wherein it
30 may be indicated for cells whether they should be included in presentations, calculations or comparisons.
14. An electronic presentation and calculation system according to claim 13, wherein the layers of two-dimensional spreadsheet layers in the stack may be sorted according to the
35 criteria of the layers or the contents of the cells.

15. An electronic presentation and calculation system according to claim 14, wherein presentations, results, calculations and comparisons are modified when the user selects a new layer (table) from the top of the stack of two-dimensional spreadsheet layers, or if the system is thus instructed in another way, or when the criteria in one or more layers of two-dimensional spreadsheet layers in the stack is/are modified.

16. An electronic presentation and calculation system according to claim 15, wherein it is possible to input data, load it to cells and two-dimensional spreadsheet layers.

10

17. An electronic presentation and calculation system according to claim 16, wherein it is possible to input, load or select data from databases, whether said data are object-oriented, relational or more simple lists, arrays or hash tables, or said data originate from on-line documents (e.g. HTML documents).

15

18. An electronic presentation and calculation system according to claims 16-17, wherein it may be determined from criteria or other selections associated by the user to the two-dimensional spreadsheet layers and/or cells in connection with previous processing which data should be input or processed, and wherein it is also possible in advance to associate layers or cell criteria during the input process.

20

19. An electronic presentation and calculation system according to claims 16-18, wherein apart from ordinary spreadsheet calculation it is also possible perform multidimensional calculations of data in stack(s) of two-dimensional spreadsheet layers.

25

20. An electronic presentation and calculation system according to claim 19, wherein it is possible in the layers of two-dimensional spreadsheet layers to show results of calculations on data, whether these data are located in cells or in two-dimensional layers of spreadsheet tables.

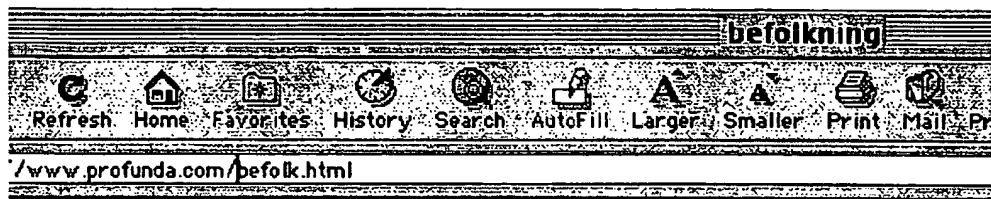
30

21. An electronic presentation and calculation system according to claim 19, wherein it is possible to select multidimensional calculation components or functions from a pop-up menu.

22. An electronic presentation and calculation system according to claims 19-21, wherein by pointing out a data set it may be determined that during loading it/they shall replace the set(s) of data currently situated in the background storage.
- 5 23. An electronic presentation and calculation system according to claims 19-22, wherein the continuous or separate columns, rows, frames in HTML documents (frames) of data to be imported to the system may be selected in e.g. a dialog box.
24. An electronic presentation and calculation system according to claim 23, wherein it is
10 possible by means of marking out of an area to determine whereto in the system data should be imported.
25. An electronic presentation and calculation system according to claims 23-24, wherein by means of a command button or otherwise it may be determined if data should be ar-
15 ranged in two-dimensional layers of tables or spreadsheet layers during import.
26. An electronic presentation and calculation system according to claims 23-25, wherein during import it may be further specified which cells or which layers of tables or two-dimensional spreadsheet layers are to receive data.
- 20
27. An electronic presentation and calculation system according to claims 23-26, wherein during import, in which data are determined to be arranged in one or more layers of two-dimensional tables or spreadsheet layers, and wherein there are not already two-dimensional tables or spreadsheet layers, new two-dimensional tables or spreadsheet layers can
25 be created.
28. An electronic presentation and calculation system according to claim 27, wherein it is possible to copy criteria from the two-dimensional tables or spreadsheet layers.
- 30 29. An electronic presentation and calculation system according to claim 28, wherein it is possible to insert criteria in several layers of two-dimensional tables or spreadsheet layers in one working operation.
30. An electronic presentation and calculation system according to claim 29, wherein it is
35 possible to have selections of layers with further specified criteria shown.

31. An electronic presentation and calculation system according to claims 29-30, wherein it is possible to view data from the side - as a virtual block.
- 5 32. An electronic presentation and calculation system according to claims 29-31, wherein it is possible view data from below - as a virtual block.
33. An electronic presentation and calculation system according to claim 32, wherein it is possible to create new data sets by dragging stacks of data and take them to a new docu-
10 ment.
34. An electronic presentation and calculation system according to claims 32-33, wherein it is possible for fields, cells, spreadsheet layers or two-dimensional tables to receive data (text, sound, images, functions, formulae) from documents created by means of said elec-
15 tronic presentation and calculation system.
35. An electronic presentation and calculation system according to claim 34, wherein it is possible by means of criteria to indicate if data thus imported from documents created by means of said electronic presentation and calculation system should be included in calcu-
20 lations.
36. An electronic presentation and calculation system according to claims 34-35, wherein it may be determined from the result of calculations if data from documents created by means of said electronic presentation and calculation system should be included in calcu-
25 lations.
37. An electronic presentation and calculation system according to claim 36, wherein a profile may be assigned to user by means of a so-called criterion cookie, said profile disclosing the criteria normally used by the user.
- 30 38. An electronic presentation and calculation system according to claims 36-37, wherein by means of a criterion cookie it may be determined whether a user has previously visited and employed said presentation and calculation system.

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3

3



2

3

1

	Kommune	PCT. Fordeling	Alle Kommuner	Hovedst
0-6-år	59363	7,45%	8,17%	7,45%
7-16-år	54179	6,47%	10,05%	6,47%
7-16 kor	54179	6,47%	10,07%	6,47%
17-19-år	14127	2,11%	3,02%	2,11%
20-24-år	55612	10,52%	5,92%	10,52%
25-34-år	123587	23,38%	13,66%	23,38%
35-39-år	36978	7,00%	6,64%	7,00%
40-64-år	121988	23,68%	29,08%	23,68%
65-74-år	29870	5,65%	7,03%	5,65%
75-84-år	28762	5,44%	4,72%	5,44%
85+år	12953	2,45%	3,63%	2,45%
Total	528598			

4

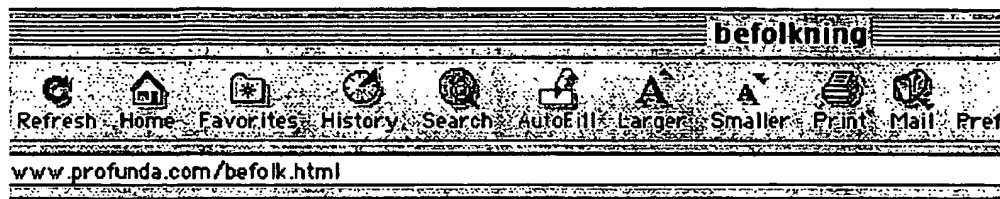
FIG. 1

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	Sociale forhold		Finansielle forhold	
	PCT. Fordeling	Alle Kommuner	Hov	
K Glostrup				
K Herlev				
K Albertslund				
K Hvidovre				
K Høje-Taastrup				
K Ledøje-Smørum				
K Lyngby-Tårnby				
K Rødovre				
K Søllerød				
K Ishøj				
K Tårnby				
K Vallensbæk				
K Værløse				
F Allerød				
F Birkerød				
F Farum	7,45%	8,17%		
F Fredensborg-Humlebæk	6,47%	10,05%		
F Frederikssund	6,47%	10,07%		
F Frederiksværk	2,11%	3,02%		
F Græsted-Gilleleje				
F Helsingør	10,52%	5,92%		
F Helsingør	23,38%	13,66%		
F Hillerød				
F Hundested	7,00%	6,64%		
FW Hørsholm	23,08%	29,08%		
FW Jægerspris				
F Karlebo	5,65%	7,03%		
F Skibby	5,44%	4,72%		
F Skævinge	2,45%	1,63%		
F Slangerup				
F Stenløse				
F Ølstykke				
R Brønshøj				
R Greve				

FIG. 2

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Generelle nøgletal Sociale forhold Finansielle forhold

W. Hørsholm

	Kommune	PCT. Fordeling	Alle Kommuner	Frederiksborg a
0-6-år	2005	7,75%	8,17%	8,72
7-16-år	2468	9,52%	10,05%	10,54
7-16 kor	2468	9,52%	10,07%	10,54
17-19-år	776	2,99%	3,02%	2,98
20-24-år	893	3,44%	5,92%	4,27
25-34-år	2321	8,95%	13,66%	11,69
35-39-år	1707	6,58%	6,64%	7,01
40-64-år	9152	35,30%	29,08%	32,46
65-74-år	2307	8,90%	7,03%	6,78
75-84-år	1406	5,42%	4,72%	3,87
85+år	424	1,64%	1,63%	1,14
Total	25927			

FIG. 3

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FW Hørsholm			
deling	Alle Kommuner	Frederiksborg amt	Sammenlignings Gruppe
73%	8,17%	8,72%	7,45%
52%	10,05%	10,54%	6,47%
52%	10,07%	10,54%	6,47%
99%	3,02%	2,98%	2,11%
44%	5,92%	4,27%	10,52%
95%	13,66%	11,69%	23,38%
58%	6,64%	7,01%	7,00%
30%	29,08%	32,46%	23,08%
90%	7,03%	6,78%	5,65%
42%	4,72%	3,87%	5,44%
64%	1,63%	1,14%	2,45%

FIG. 4

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WX Jægerspris

	Kommune	PCT. Fordeling	Alle Kommuner	Frederiksborg
0-6-år	778	7,48%	8,17%	6,5
7-16-år	1110	10,67%	10,05%	10,5
7-16 kor	1110	10,67%	10,07%	10,5
17-19-år	261	2,51%	3,02%	2,9
20-24-år	422	4,06%	5,92%	4,2
25-34-år	1072	11,27%	13,66%	11,6
35-39-år	748	7,19%	6,64%	7,0
40-64-år	3520	33,84%	29,08%	32,4
65-74-år	788	7,58%	7,05%	6,7
75-84-år	395	3,80%	4,72%	3,8
85+år	97	0,93%	1,63%	1,1
Total	10401			

11

Valgtræ Tilbage Til Gruppe Slet fra G

FIG. 5

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FW Hørsholm			
FWX Jægerspris			
	PCT. Fordeling	Alle Kommuner	Frederiksborg
F Karlebo	7.48%	8.17%	8.17%
F Skibby	10.67%	10.05%	10.05%
F Skævinge	10.67%	10.07%	10.07%
F Slangerup	12.51%	3.02%	2.51%
F Stenløse	4.06%	5.92%	4.06%
F Ølstykke	11.27%	13.66%	11.27%
R Bramsnæs	7.19%	6.64%	7.19%
R Greve	33.84%	29.08%	32.84%
R Gundsø	7.58%	7.03%	6.58%
R Hvalsø	3.80%	4.72%	3.80%
R Køge	0.93%	1.63%	0.93%
R Lejre			
R Ramsø			
R Roskilde			
R Skovbo			
R Solrød			
RZ Vallø			
Y Bjergsted			
Y Dianalund			
Y Dragsholm			
Y Fuglebjerg			
Y Gørlev			
Y Hørsholm			
Y Haslev			
Y Holbæk			

FIG. 6

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FW Hørsholm			
FWX Jægerspris			
	PCT. Fordeling	Alle Kommuner	Frederiksborg
F Karlbo	7.48%	8.17%	8.17%
F Skibby	10.67%	10.05%	10.05%
F Skævinge	10.67%	10.07%	10.07%
F Slangerup	12.51%	3.02%	3.02%
F Stenløse	4.06%	5.92%	5.92%
F Ølstykke	11.27%	13.66%	13.66%
R Brønshøj	7.19%	6.64%	6.64%
R Greve	33.84%	29.08%	29.08%
R Gundsø	7.58%	7.03%	7.03%
R Hvalsø	3.80%	4.72%	4.72%
R Køge	0.93%	1.63%	1.63%
R Lejre			
R Ramsø			
R Roskilde			
R Skovbo			
R Solrød			
RZ Vallø			
V Bjergsted			
V Dianalund			
V Dragsholm			
V Fuglebjerg			
V Gørlev			
V Haslev			
V Haslev			
V Holbæk			

FIG. 6

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FW Hørsholm

deling	Alle Kommuner	Frederiksborg amt	Sammenlignings Gruppe
73%	8,17%	8,72%	7,45%
52%	10,05%	10,54%	6,55%
52%	10,07%	10,54%	6,55%
99%	3,02%	2,98%	2,11%
44%	5,92%	4,27%	10,40%
95%	13,66%	11,69%	23,15%
58%	6,64%	7,01%	7,00%
30%	29,08%	32,46%	23,29%
90%	7,03%	6,78%	5,69%
42%	4,72%	3,87%	5,41%
64%	1,63%	1,14%	2,42%

13

FIG. 7

Storey number: 1
 Storey name:

Criteria ▼

☒ Storey Included

14

FIG. 8

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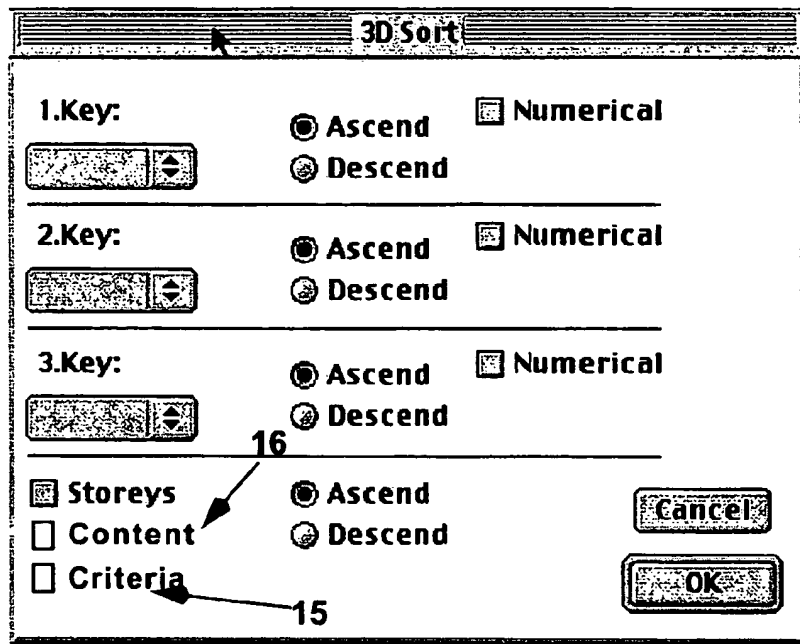


FIG. 9

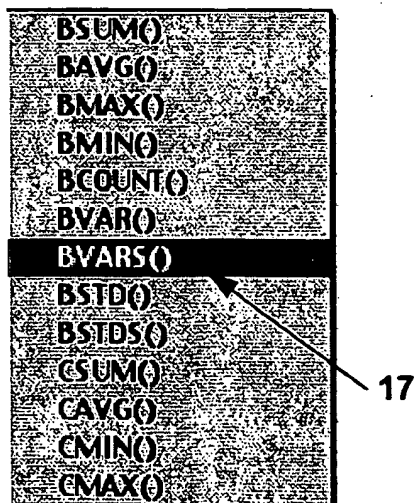


FIG. 10

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1	4	7
2	5	8
3	6	9

18

FIG. 11

11	14	17
12	15	18
13	16	19

19

FIG. 12

20

9	8	7
19	18	17

FIG. 13

1	4	7
2	5	8
3	6	9

21

FIG. 14

22

6	5	4
16	15	14

FIG. 15

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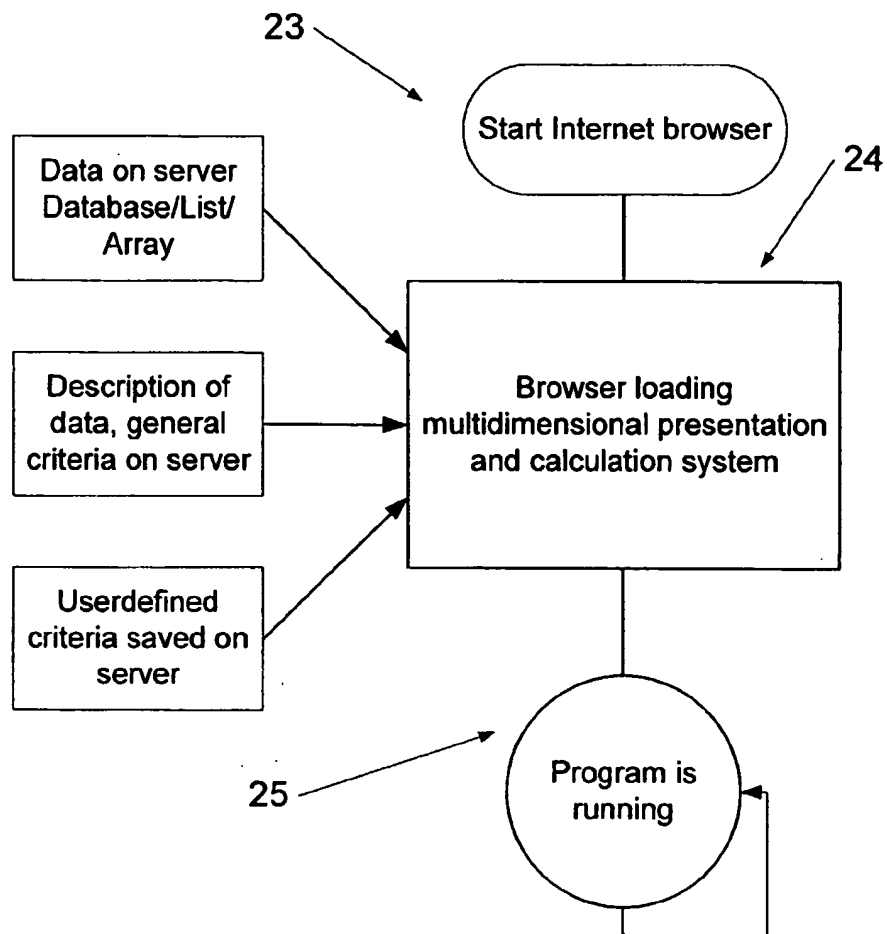
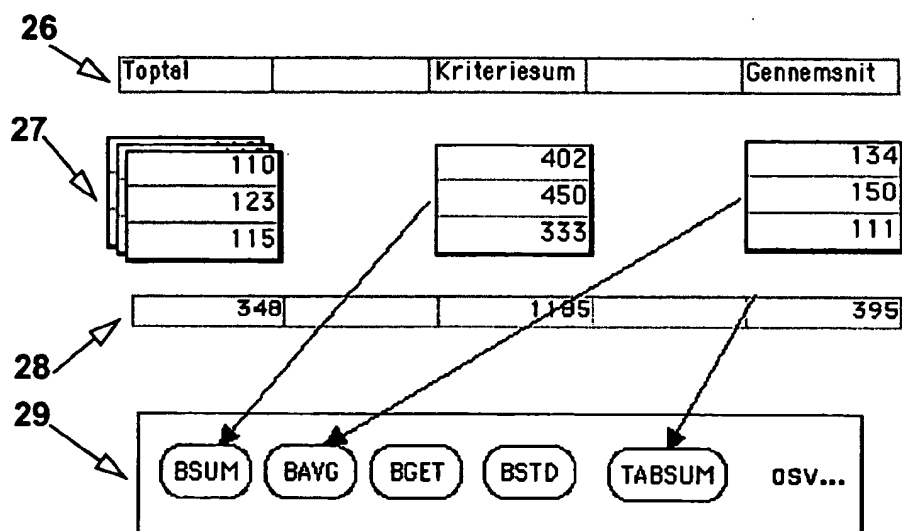


FIG. 16

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**FIG. 17**

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		Ålborg	Total	
0-6-år	13778	8,57%	9,09%	48...
7-16-år	16042	9,97%	11,18%	59...
17-19-år	5210	3,24%	3,35%	17...
20-24-år	15026	9,34%	6,59%	35...
25-34-år	26954	16,76%	15,19%	80...
35-39-år	11260	7,00%	7,39%	39...
40-64-år	48669	30,26%	32,34%	17...
65-74-år	12708	7,90%	7,81%	41...
75-84-år	8602	5,35%	5,25%	27...
85-år	2586	1,61%	1,81%	96...

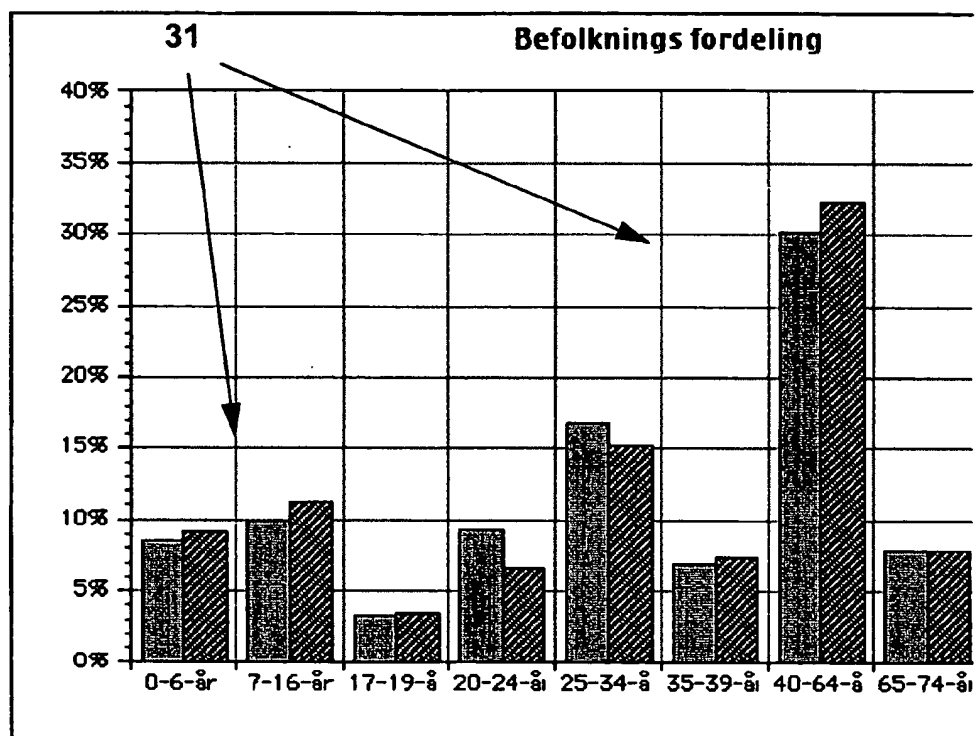


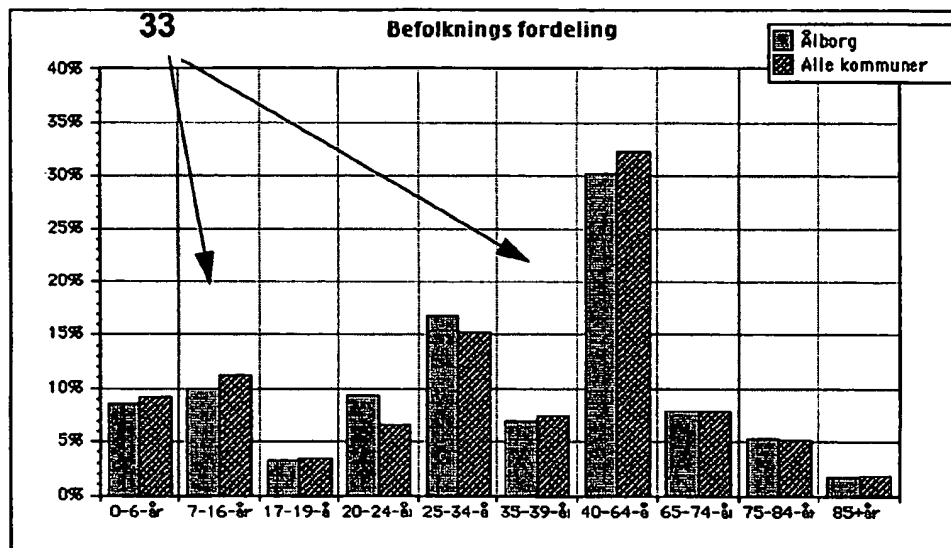
FIG. 18

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Kommunale nøgletal 1999**32**

Resourceforbrug på 11 udgiftsområder og befolkningsfordeling samt decimal-justi

Aalborg Kommune	Alle kommuner	Aalborg Kommune i procent af Alle
Administrativt personale pr indb.	10,34	89,94%
Samspil med borgere pr 0-16 år	30197,57	128,05%
Udviklingsudgifter pr 0-16 år	44232,59	108,01%
Bibliotek pr indb.	333,00	135,74%
Kulturelle og rekreative aktiviteter	215,26	274,08%
Udviklingsudgifter pr 0-16 år	41919,88	119,13%
Samspil med borgere pr 0-16 år	4372,43	125,99%
Bibliotek pr indb.	421,27	182,07%
Udviklingsudgifter pr 0-16 år	2847,82	165,07%
Udviklingsudgifter pr 0-16 år	1486,04	76,71%
Udviklingsudgifter pr 0-16 år	7,98	82,69%

**FIG. 19**

INTERNATIONAL SEARCH REPORT

International application No.

PCT/DK 01/00274

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: G06F 17/60, G06F 17/24

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: G06F

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

WPI DATA, EPO-INTERNAL

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	WO 9721176 A1 (H.KJAER ET AL.), 12 June 1997 (12.06.97), page 4, line 10 - line 12; page 5, line 1 - page 6, line 27; page 14, line 5 - line 7 --	1-38
P,X	EP 0997834 A2 (HYPERION SOLUTIONS CORPORATION), 3 May 2000 (03.05.00), page 2, line 40 - line 41; page 3, line 53 - page 4, line 2; page 5, line 3 - line 15, page 6, lines 9 - 13; page 9, lines 26 - 38; page 10, lines 31 - 33 -- -----	1-38

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

* Special categories of cited documents:

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"E" earlier application or patent but published on or after the international filing date

"L" document which may throw doubts on priority claim(s) or which is cited to establish the publication date of another citation or other special reason (as specified)

"O" document referring to an oral disclosure, use, exhibition or other means

"P" document published prior to the international filing date but later than the priority date claimed

"I" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention

"X" document of particular relevance: the claimed invention cannot be considered novel or cannot be considered to involve an inventive step when the document is taken alone

"Y" document of particular relevance: the claimed invention cannot be considered to involve an inventive step when the document is combined with one or more other such documents, such combination being obvious to a person skilled in the art

"&" document member of the same patent family

Date of the actual completion of the international search

23 August 2001

Date of mailing of the international search report

14. 09. 2001

Name and mailing address of the ISA/
European Patent Office

Authorized officer

Jesper Bergstrand/LR

Facsimile No.

Telephone No.

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/08/01

International application No.

PCT/DK 01/00274

Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9721176	A1	12/06/97	AU	4327396 A	27/06/97
				DK	9500490 U	26/01/96

EP	0997834	A2	03/05/00	NONE		

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